REMARKS

Claim 1 has been amended to incorporate therein the recitation of claim 7, and to further recite that a phosphorus atom concentration at a bottom of the light-emitting layer is 5×10^{18} cm^{-3} to 2×10^{20} cm^{-3}. Support is found at page 13, lines 10-14 of the specification. Claim 7 has been canceled.

Further, the specification at page 18 has been amended to correct an obvious, inadvertent error.

Review and reconsideration on the merits are requested.

Claims 1-11 and 13 were rejected under 35 U.S.C. § 102(b) as being anticipated by WO 2003/065465 to Udagawa, with reference to U.S. Patent No. US 7,465,499 as an English language equivalent. WO '465 was cited as disclosing each of the terms of the rejected claims, including a first cubic boron phosphide-based semiconductor layer 103 provided on a surface of substrate 101 containing twins; a light-emitting layer 104 composed of a hexagonal Group III nitride semiconductor provided on the first cubic boron phosphide-based semiconductor layer 103; and a second cubic boron phosphide-based semiconductor layer 105 provided on the light-emitting layer 104 containing twins and having a conduction type different from that of the first cubic boron phosphide-based semiconductor layer.

The Examiner further considered that "With respect to claim 7, the diffusion of phosphorus atoms into the light emitting layer 104 will result in the recited profile."

Applicant respectfully disagrees, and submits that the amendment to claim 1 patentably distinguishes over WO '465 for the following reasons.

(1) As described at page 12, line 28 to page 13, line 18 of the present specification, in the present invention, the profile of phosphorus atom concentration recited in claim 7 is formed

by gradually discharging a phosphorus source gas to the outside of the growth system and growing a light-emitting layer. This means that the profile recited in claim 7 is formed by controlling the components of the source gas, but not by diffusion into the light-emitting layer of phosphorus. This is a feature of the present invention that is greatly differs from that of the invention of WO '465.

Particularly, the phosphorus atom concentration at the bottom of the light-emitting layer is arranged at 5×10^{18} cm^{-3} or higher but 2×10^{20} cm^{-3} or lower, which provides an effect of improving the adhesion between the light-emitting layer and the first boron phosphide-based semiconductor layer (page 13, lines 10-14 of the present specification).

(2) In contrast, WO '465 fails to disclose the claimed light-emitting layer having a phosphorus atom concentration gradient.

In reference to US 7,465,499, both the semiconductor layers of the lower clad layer 103 and the upper clad layer (105) are formed by using the boron phosphide-based polycrystalline layer (claims 1 and 5). However, a growth rate of these layers of smaller than 20 nm/min results in vaporization of phosphorus (P), which makes these layers have a stoichiometrically non-equilibrium composition (column 6, lines 50-54). Therefore, WO '465 describes that the above-mentioned growth rate is preferably 20-60 nm/min (column 6, lines 36-39, claim 4).

Further, WO '465 instructs that it is preferable to make equal the strain quantities imposed on the light-emitting layer (104) from the upper clad layer (105) and lower clad layers (103) to obtain stable emission of light from the light-emitting layer (column 9, lines 40-46).

WO '465 further describes that, when these layers (103) and (105) are composed of the same phosphide polycrystal layer, the strains imposed on the light-emitting layer (104) from these layers (103} and (105) can be made almost equal in the quantity (column 9, lines 19-23).

Actually, the semiconductor layers of the lower clad layer (103) and the upper clad layer (105) shown in FIG. 5 of WO '465 are formed at growth rates of 40 nm/min and 30 nm/min, respectively. Further, since the carrier concentrations of the semiconductors of the lower clad layer (103) and the upper clad layer (105) are 1×10^{19} cm^{-3} and 8×10^{18} cm^{-3}, respectively, one can expect that these layers (103) and (105) are formed of almost the same phosphide polycrystal layer.

Accordingly, the quantity of phosphorus atoms which have diffused into the light-emitting layer (104) from the layer (103) is almost equal to the quantity of phosphorus atoms which have diffused into the light-emitting layer (104) from the layer (105).

Therefore, the claimed phosphorus atom concentration gradient does not result from the growth conditions of the lower clad layer (103) and the upper clad layer (105) disclosed in WO '465.

As discussed above, WO '465 does not disclose or suggest a light-emitting layer having a phosphorus atom concentration gradient as claimed in amended claim 1. Further, because WO '465 fails to disclose one or more limitations of amended claim 1, it is respectfully submitted that the amended claims are not anticipated by WO '465 and withdrawal of the foregoing rejection under 35 U.S.C. § 102(b) is respectfully requested.

Claims 1-11 and 13 were rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over the claims of US '499.

Applicant relies on the response above with respect to the rejection under § 102(b) over WO '465. Namely, US '499 does not disclose, let alone claim, the phosphorus atom concentration gradient as claimed in amended claim 1.

Withdrawal of the foregoing obviousness-type double patenting rejection is respectfully requested.

Withdrawal of all rejections and allowance of claims 1-6 and 8-15 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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